

REMARKS

Claims 1 to 3, 5, 7, 8, and 14 to 16 are pending, of which claim 1 is independent.

Favorable reconsideration and further examination are respectfully requested.

Claims 1 to 3 and 5 to 13 were rejected for allegedly failing to comply with the enablement and written description requirements.¹

The features that were being objected to have been removed from claim 1; however, new claim 15 recites that, following sintering, the second ceramic material has a relative permittivity ϵ_2 , where $18 \leq \epsilon_2 \leq 22$. This is a feature that the Examiner claims is not enabled by the specification, as explained in the following excerpt from the January 21, 2009 Office Action:

Claims 1-3 and 5-13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This rejection is maintained from the previous Office action mailed 9 July 2008 and is maintained here. Applicant's comments regarding this are addressed below in the "Response to Arguments" section.

Claim 6 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In the current case the use of a second ceramic material having a relative permittivity ϵ_2 , where $18 \leq \epsilon_2 \leq 22$ is found to not be enabled.

2

As previously explained, a K20 material is listed as an example in the specification. It remains our position that one of ordinary skill in the art would have understood how to manufacture a

¹ Office Action, page 2

² Office Action of January 21, 2009, page 2

K20 material at the time this application was originally filed. In this regard, an example dielectric material may include Al_2O_3 , along with different kinds of glass, including SiO_2 , NaO_2 , MgO , and other oxides. Prior to debinding, the dielectric may also include a binder, which is usually organic, and which is removed during debinding. It is our position that one of ordinary skill in the art would have known how to increase and/or decrease the relative permittivity of the dielectric by adding chemicals in the appropriate amounts to produce the K20 material.

The above example was presented in the Amendment filed on April 21, 2009. In the current Office Action, however, the Examiner states:

Response to Arguments

Applicant's arguments filed 21 April 2009 have been fully considered but they are not persuasive.

Applicants first assert that one skilled in the art would have understood how to manufacture a K20 material at the time the current application was filed.

This is not found persuasive because Applicants have not provided any evidence that one skilled in the art would have been able to do this, and have not provided any material or composition which meets this range, or evidence that such a material or composition was known at the time this application was filed.

3

The foregoing statement is incorrect insofar as we have provided, in the example reiterated above, an example of a material that is covered by the claim feature.

The Office Action further states the following:

³ Office Action, page 7

Applicants finally point out the apparent contradiction between rejecting the claims under 35 USC §112, first paragraph, and 35 USC §103(a) as obvious over what would have been obvious to one of ordinary skill in the art.

The rejections do not depend on or rely on each other, and each stands on its own. In the interest of compact prosecution all potential rejections are presented in the same Office action, instead of placing each in a subsequent action. Further, this position does not appear to be any more contradictory than Applicants' position that one skilled in the art would have known how to make a K20 material but that such a material would have been novel and non-obvious.

4

We respectfully disagree that our position is contradictory. If it was not clear before, what we are saying is that one of skill in the art would have known how to make a K20 material, but that it would not have been obvious to use such a material in the manner claimed. There is nothing whatsoever that is contradictory about that. By contrast, the position proffered by the office appears to be that one of skill in the art would not have known how to make a K20 material (even in light of the teachings contained in the Applicants' patent application); nevertheless, such a material would have been obvious to use even though (i) nobody knows how to make it and (ii) there is no evidence that it can be used in such a manner. Although we appreciate the Examiner's comments regarding compact prosecution, we respectfully submit that the two positions taken together cannot both stand.

For at least the foregoing reasons, we reiterate our request to have the §112, first paragraph, rejection removed.

Turning to the art rejections, claims 1, 2 and 5 to 9 were rejected over Herron (U.S. 4,627,160); claim 3 was rejected over Herron in view of Nakatani (U.S. 5,252,519); claim 10

⁴ Office Action, page 8

was rejected over Herron in view of Harada (U.S. 2001/0022416); and claims 11 to 13 were rejected over Herron, Harada, and Tamhankar (U.S. 5,230,846). As shown above, features of former dependent claims 12 and 13 have been incorporated into independent claim 1.

Independent claim 1 now recites:

1. A method of producing a ceramic substrate comprised of a base that comprises layers in a stack, each layer in the stack comprising a non-sintered ceramic material and a binder, the method comprising:
debinding the layers in a temperature interval of T_{E1} to T_{E3} , where T_{E1} is a minimum debinding temperature and $T_{E3} > T_{E1}$; and
sintering the layers at a temperature T_S , where $T_S \geq T_{E3}$;
wherein debinding and sintering are performed in a same furnace;
wherein a temperature T of the base does not fall below T_{E1} during debinding and sintering;
wherein debinding begins at a temperature between T_{E1} and T_{E2} that increases at an increasing rate, where $T_{E1} < T_{E2} < T_{E3}$, whereafter T decreases to a value of T_{E1} , where $T_{E1} \leq T_{E2} < T_{E3}$;
wherein a first part of debinding is performed in an atmosphere that is inert; and
wherein, during debinding, an atmosphere in the furnace changes from an inert atmosphere to an air atmosphere in accordance with a reduction in temperature to T_{E1} .

The applied art is not understood to disclose or to suggest at least underlined portions of claim 1 above. In this regard, the Office Action states the following regarding Herron and Harada:

Herron and Harada are relied upon as discussed above, but fail to teach that
during debinding the environment is switched from inert to air (specifically the special
case as recited in claim 13, or the firing cycle recited in claim 12).

5

Tamhankar, however, was cited to make up for the foregoing deficiencies in Herron and Harada. In particular, the Office Action states:

⁵ Office Action, page 6

Tamhankar discloses a method of firing a ceramic substrate substantially similar to that of Herron and Harada. Tamhankar discloses that during the firing cycle a first temperature is reached where debinding begins (T_{E1} , around 200°C), firing and debinding is then continued up to 500°C in a nitrogen/oxygen/water vapor environment. After a hold at 500°C (T_{E2}), the temperature is reduced to 485°C (T_{E1}) while the firing environment is changed, during this time the environment is nitrogen/hydrogen/water vapor. Firing is then continued (with the temperature never dropping below T_{E1} , 200°C) to a sintering temperature in a nitrogen/water vapor environment (Fig 1).

6

Fig. 1 is reproduced below, with labels added by us:

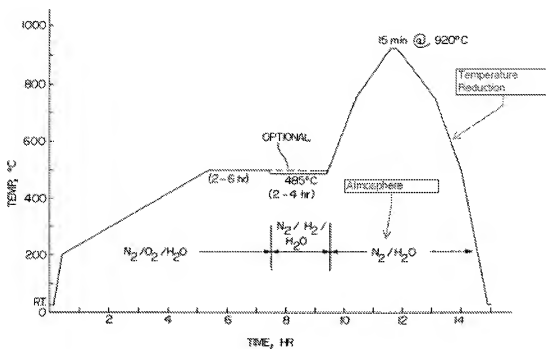


FIG. 1

As shown above, during temperature reduction, the atmosphere does not change from inert to air. Rather, it is maintained at N_2/H_2O . In fact, during temperature reduction, the gases in the atmosphere remain the same. It is only at the transition points that the gases change.

In this regard, as described on page 4 of the application, one benefit of temperature reduction is to “prevent rapid emergence of carbon dioxide from the layers”. We do not understand this to be a purpose of Tamhankar’s temperature reduction. Consequently, we do not believe that it would have been obvious to substitute air for the gases shown in the third stage of Fig. 1, much less to substitute air for the gases in only the latter part of that stage.

For at least the foregoing reasons, claim 1 is believed to be patentable over the art.

Dependent claims are believed to define patentable features. Each dependent claim partakes of the novelty of its corresponding independent claim, in light of the foregoing amendments, and, as such, has not been discussed specifically herein.

It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

In view of the foregoing amendments and remarks, we respectfully submit that the application is in condition for allowance, and such action is respectfully requested at the Examiner's earliest convenience.

Please charge any additional fees, or credit any overpayment, to deposit account 06-1050, referencing Attorney Docket No. 14219-074US1.

REQUEST FOR TELEPHONE INTERVIEW

If the foregoing arguments do not place the application in condition for allowance, the Examiner is respectfully requested to contact the undersigned to arrange a telephone interview prior to issuing a new action.

Respectfully submitted,

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Date: _____

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